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FAIRCHILD SEMICONDUCTOR®

August 2005

FDFM2P110

Integrated P-Channel PowerTrench® MOSFET and Schottky Diode

General Description

FDFM2P110 combines the exceptional performance of Fairchild's PowerTrench MOSFET technology with a very low forward voltage drop Schottky barrier rectifier in a MicroFET package.

This device is designed specifically as a single package solution for Buck Boost. It features a fast switching, low gate charge MOSFET with very low on-state resistance.

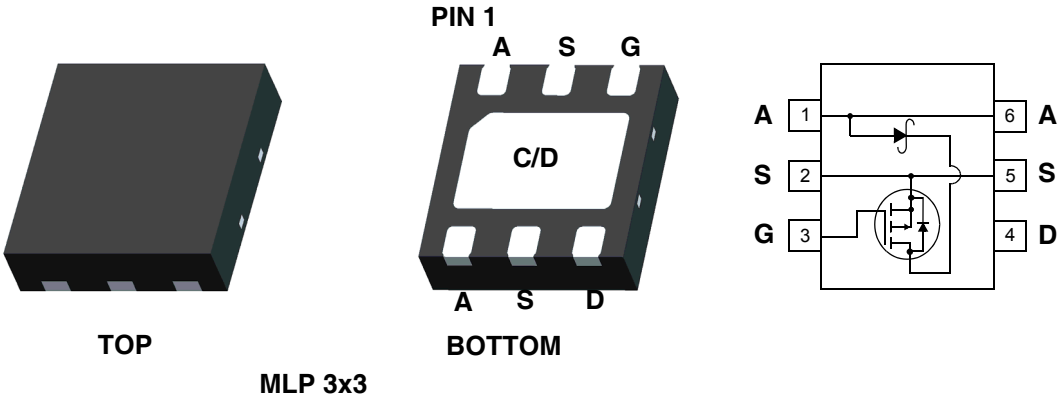
Applications

- Buck Boost

Features

- -3.5 A, -20 V $R_{DS(ON)}$ = 140mΩ @ V_{GS} = -4.5 V

  $R_{DS(ON)}$ = 200mΩ @ V_{GS} = -2.5 V
- Low Profile - 0.8 mm maximun - in the new package MicroFET 3x3 mm



TOP BOTTOM

MLP 3x3

Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		-20	V
V_{GSS}	Gate-Source Voltage		±12	V
I_D	Drain Current -Continuous	(Note 1a)	-3.5	A
	-Pulsed		-10	
V_{RRM}	Schottky Repetitive Peak Reverse voltage		20	V
I_O	Schottky Average Forward Current	(Note 1a)	2	A
P_D	Power dissipation (Steady State)	(Note 1a)	2	W
		(Note 1b)	0.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	60	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	145	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
2P110	FDFM2P110	7inch	12mm	3000 units

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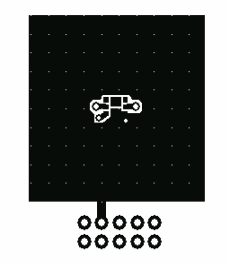
Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
B_{VDSS}	Drain-Source Breakdown Voltage	I_D = -250μA, V_{GS} = 0V	-20	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250μA, Referenced to 25°C	-	-11	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = -16V	-	-	-1	μA
I_{GSS}	Gate-Body Leakage,	V_{GS} = ±12V, V_{DS} = 0V	-	-	±100	nA
On Characteristics (Note 2)						
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250μA	-0.6	-1.0	-1.5	V
$\frac{\Delta V_{GS(TH)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = -250μA, Referenced to 25°C	-	3	-	mV/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	I_D = -3.5A, V_{GS} = -4.5V	-	101	140	mΩ
		I_D = -3.0A, V_{GS} = -2.5V	-	145	200	
		I_D = -3.5A, V_{GS} = -4.5V, T_J = 125°C	-	136	202	
$I_{D(ON)}$	On-State Drain Current	V_{GS} = -2.5V, V_{DS} = -5V	-10	-	-	A
g_{FS}	Forward Transconductance	I_D = -3.5A, V_{DS} = -5V	-	6	-	S
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{DS} = -10V, V_{GS} = 0V, f = 1MHz	-	280	-	pF
C_{OSS}	Output Capacitance		-	65	-	pF
C_{RSS}	Reverse Transfer Capacitance		-	35	-	pF
R_G	Gate Resistance	f = 1MHz	-	7	-	Ω
Switching Characteristics (Note 2)						
$t_{d(ON)}$	Turn-On Delay Time	V_{DD} = -10V, I_D = -1A, V_{GS} = -4.5V, R_{GEN} = 16Ω	-	8	16	ns
t_r	Turn-On Rise Time		-	12	22	ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	11	20	ns
t_f	Turn-Off Fall Time		-	3.2	6.4	ns
Q_g	Total Gate Charge	V_{DS} = -10V, I_D = -3.5A, V_{GS} = -4.5V	-	3	4	nC
Q_{gs}	Gate-Source Charge		-	0.7	-	nC
Q_{gd}	Gate-Drain Charge		-	1	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	-2	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = -2 A (Note 2)	-	-0.9	-1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F= -3.5A, dI_F/dt=100A/μs	-	13	-	ns
Q_{rr}	Diode Reverse Recovery Charge		-	3	-	nC
Schottky Diode Characteristic						
V_R	Reverse Voltage	I_R = 1mA	20	-	-	V
I_R	Reverse Leakage	V_R = 5V, T_J = 25°C	-	-	100	μA
		T_J = 100°C			10	mA
V_F	Forward Voltage	I_F = 1A, T_J = 25°C	-	0.32	0.39	V

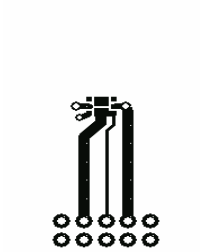
Electrical Characteristics T_A = 25°C unless otherwise noted

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta CA}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 60°C/W when mounted on a 1in^2 pad of 2 oz copper



b) 145°C/W whe mounted on a minimum pad of 2 oz copper

Scale 1: 1 on letter size paper

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

Typical Characteristics

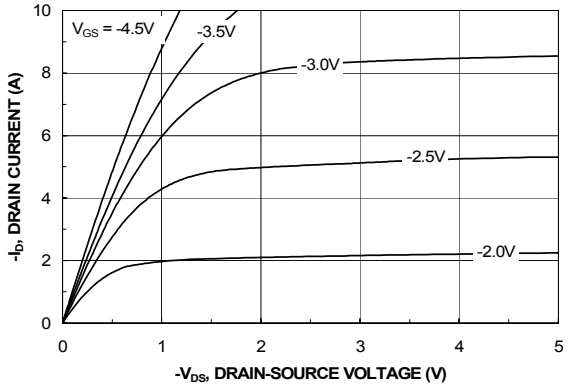


Figure 1. On-Region Characteristics

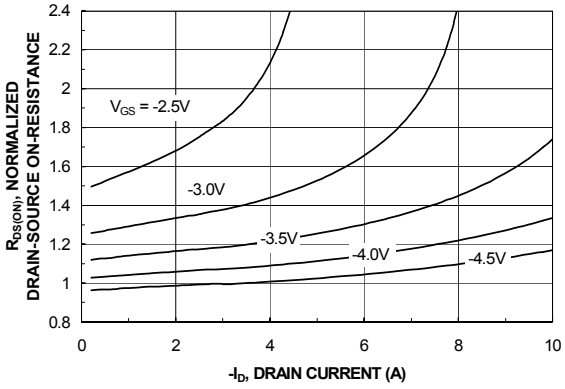


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

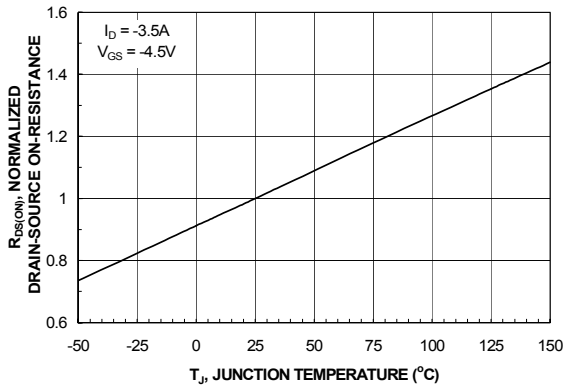


Figure 3. On-Resistance Variation with Temperature

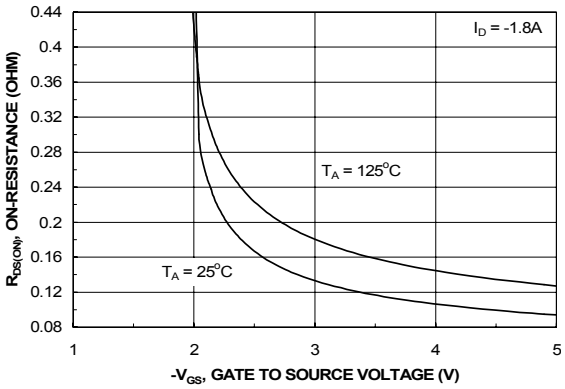


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

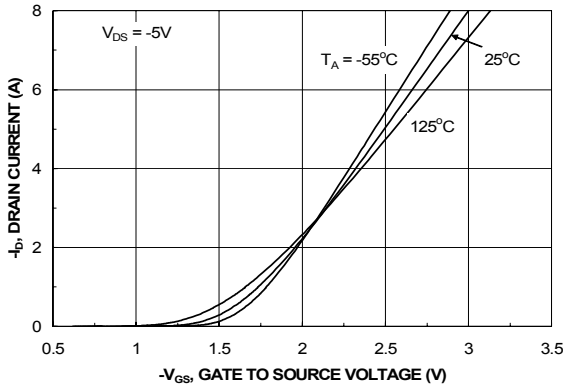


Figure 5. Transfer Characteristics

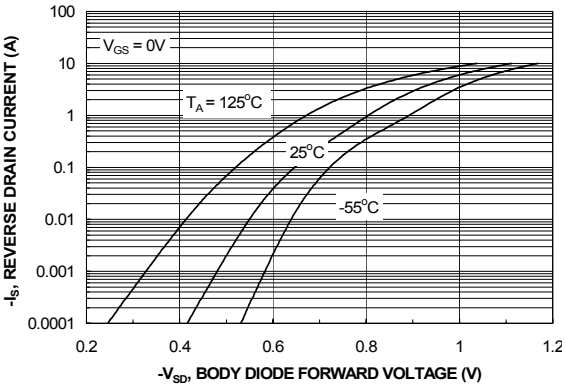


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

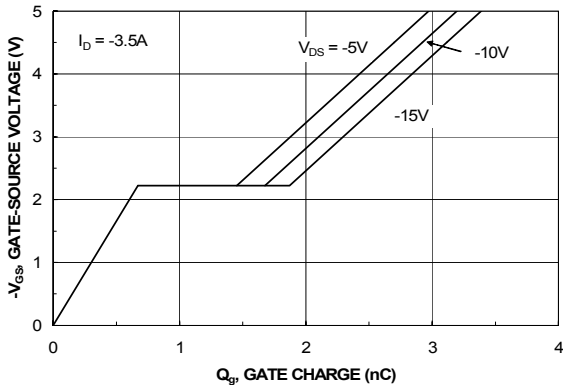


Figure 7. Gate Charge Characteristics

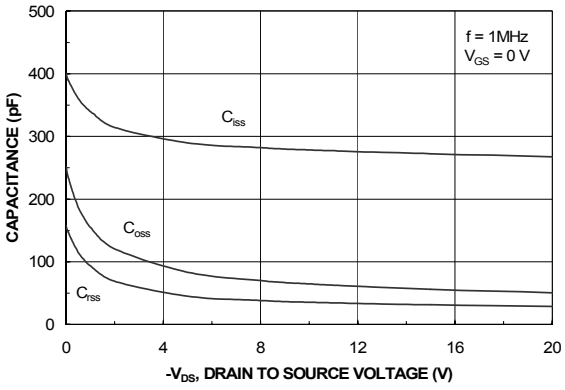


Figure 8. Capacitance Characteristics

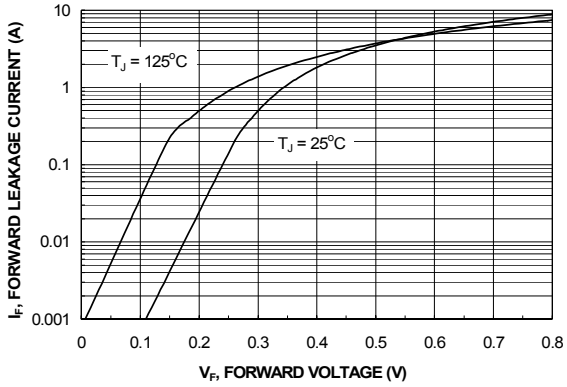


Figure 9. Schottky Diode Forward Voltage

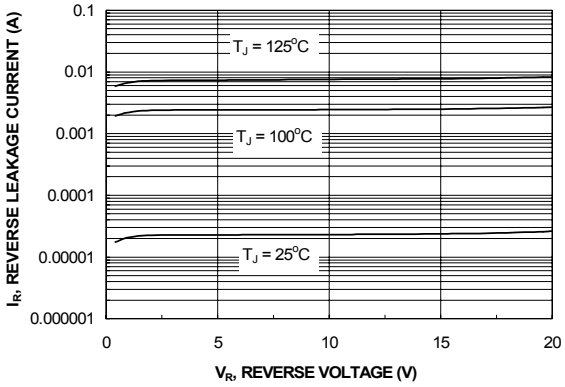


Figure 10. Schottky Diode Reverse Current

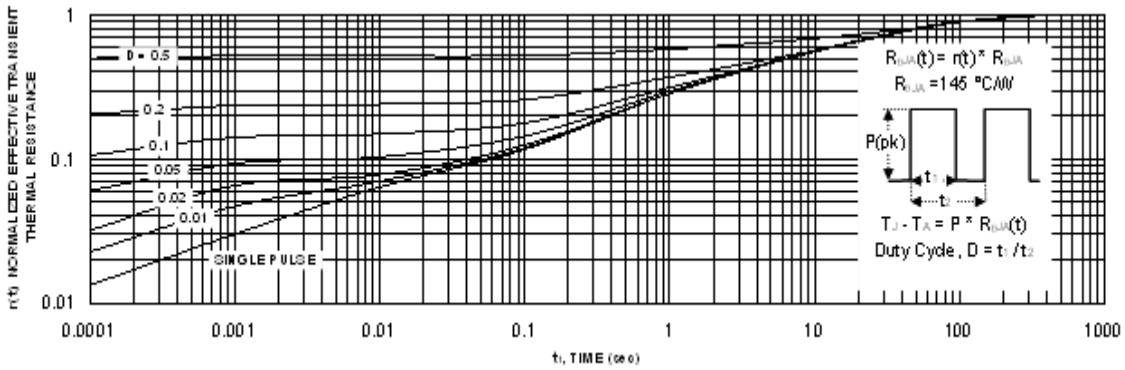
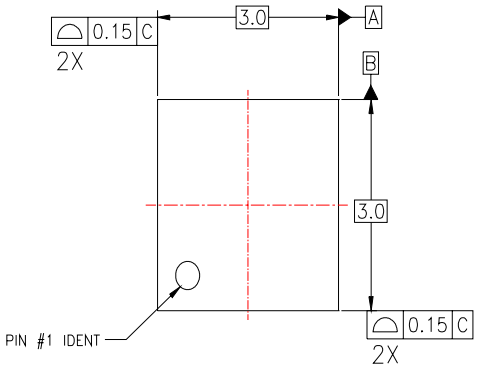
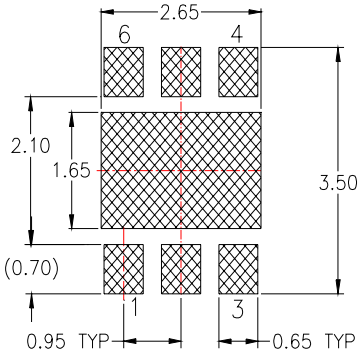


Figure 11. Transient Thermal Response Curve

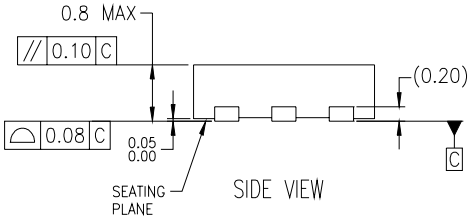
Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.



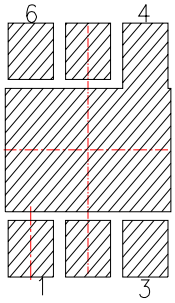
TOP VIEW



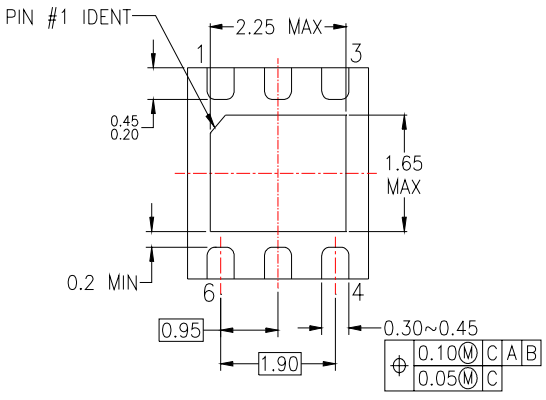
RECOMMENDED LAND PATTERN



SIDE VIEW



RECOMMENDED COPPER TRACE



BOTTOM VIEW

NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION WEEA, DATED 11/2001

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

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